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ABSTRACT

This manual contains a work sample intended to assess a handicapped student's interest in and to screen interested students into a training program in basic mechanical drawing. (The course is based on the entry level of an assistant drafter.) Section 1 describes the assessment, correlates the work performed and worker traits required for completing the work sample, and lists related occupations and DOT codes. Instructions to the evaluator are provided in the next section. The conditions and administration equipment are detailed, and the set-up and breakdown procedures are illustrated. Section 3, on administration, provides a student orientation including student material with an explanation and illustration of equipment and/or procedures. This section also contains instructions for task procedures actions to be taken, as well as post sample interview topics. Section 4 explains the method of scoring and provides forms. Section 5 lists technical data (norms, reliability, validity) to be included in a supplement to this manual. Contents of the section on maintenance and construction include information on tool and equipment maintenance, a materials list (equipment, source, price), work sample diagrams and/or photographs, and assembly instructions. Section 7 cites references. An appendix defines terms. (YLB)

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DRAFTING

Work Sample

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TABLE OF CONTENTS

SECTION HEADING		PAGE
I.	INTRODUCTION	1
	A. Assessment Description	1
	B. Related Occupations	3
II.	INSTRUCTIONS TO THE EVALUATOR	4
	A. Work Sample Conditions	4
	B. Administration Equipment	5
	C. Setup and Breakdown	5
III.	ADMINISTRATION	8
	A. Student Orientation	8
	B. Instruction and Demonstrations	9
IV.	SCORING	12
	A. Explanations	12
	B. Forms	12
V.	TECHNICAL DATA	16
VI.	MAINTENANCE AND CONSTRUCTION	17
	A. Maintenance	17
	B. Materials List and Equipment List	17
	C. Diagrams (Figures)	18
	D. Assembly Instructions	21
VII.	REFERENCES	22
	APPENDIX	

I. INTRODUCTION

A. Assessment Description

The Drafting Work Sample is intended to assess a student's interest in and screen interested students into a training program in Basic Mechanical Drawing. This course is 36 weeks in length and is based upon the entry level of a Drafter, Assistant job - - (DOT-017.281-018).

The job of Drafter Assistant falls within the drafters, n.e.c. (017) Occupational Group Arrangement and Engineering Technology, Worker Trait Group. (05-03).

It should be kept in mind that following are the various activities and worker traits that are associated with an Assistant Drafter. Most of these activities and Worker Traits would also be required of a student working in a Basic Mechanical Drawing Course, only with less demands.

Also, it should be understood that many of the worker trait values would bc higher for the Assistant Drafter than the student in the Basic Mechanical Drawing Course.

The work performed and Worker Traits required for completing the Drafting Work Sample are as follows:

WORK PERFORMED	WORKER TRAITS REQUIRED
1. Positions drawing paper on drawing board	GED 3 SVP 1 APT G-4, V-4, N-5, S-3, P-3 Q-4, K-3, F-3, M-3, E-5 C-5 W.A. 1, 7, 9 W.S. 7, 8, 10 P.D. S, L, 4, 5, 6 W.C. O, B
2. Measures and draws working drawing	GED 4 SVP 2 APT G-3, V-4, N-3, S-3, P-3 Q-3, K-3, F-2, M-3, E-5 C-5 W.A. 1, 7, 9 W.S. 7, 8, 10 W.C. 1 P.D. S, L, 4, 5, 6
3. Draws details according to instructions	GED 3 SVP 2 APT G-3, V-4, N-3, S-3, P-3 Q-3, K-3, F-2, M-3, E-5 C-5 W.A. 1 W.S. 7 P.D. L, 4, 5, 6 W.C. 1
4. Maintains drafting equipment	GED 4 SVP 1 APT G-4, V-4, N-5, S-4, P-4 Q-5, K-4, F-3, M-3, E-5 C-5

B. Related Occupations

Drafting Work Sample

DOT description:

DRAFTER, ASSISTANT (017.281-018)

Related Occupations	DOT Code
DRAFTER, APPRENTICE	017.281-014
AUTO-DESIGN DETAILER	017.281-010
DRAFTER, PLUMBING	017.261-038
DRAFTER, HEATING AND VENTILATING	017.261-034
DRAFTER, DETAIL	017.261-030
DRAFTER, COMMERCIAL	017.261-026

II. INSTRUCTIONS TO THE EVALUATOR

A. Work Sample Conditions

The Drafting Work Sample is to be administered indoors with little or no noise from neighboring areas. Also, no dust and good overhead lighting is required.

The sample involves sedintary work, and must be performed by a person with both hands or one who has equivalent manual and finger dexterity from a chair or wheelchair. This Work Sample was designed to allow the evaluator to be able to determine whether the client had the necessary skills to successfully pass a Basic Mechanical Drawing Course in high school. The Work Sample is not physically hazardous in any way, and requires no safety equipment although all health and safety precautions should be adhered to regarding Occupational Safety and Health Act requirements as well as those safety factors which may be encountered in local industry and unique job requirements. This Work Sample is limited to a right handed student. A left handed drafting machine must be substituted if the student is left handed.

B. Administration Equipment

The following equipment is required prior to administration:

Evaluator Equipment:

- Stopwatch
- Manual for the Drafting Work Sample
- Task observation sheet

Student Equipment:

- Drafting board and drafting machine
- Table or workbench (30" high)
- Stool
- Sharpened pencil (2H) and drawing paper
- Masking tape
- Wiping cloth
- Eraser
- Drafting brush
- Scales (9") 2 required

C. Setup and Breakdown

The correct setup and breakdown procedures for the Drafting Work Sample are as follows:

The student sits in front of the Work Sample with the drafting board laid flat on the table or bench. The drafting tools are placed to the right of the Drafting Work Sample for ease of usage by the student.

The student should spend additional time, if necessary, gaining experience in manipulating the drafting machine with his left hand. The evaluator may demonstrate the correct techniques or usage of the drafting machine if necessary.

An illustration of correct setup for the Drafting Work Sample is shown in Figure 1. While giving instructions and pointing out Work Sample parts, the evaluator stands to the right of the student so as not to obstruct the student's view of the Work Sample. No alterations are required for wheelchair persons. Left handed students will need a left handed drafting machine to complete the Drafting Work Sample exercise successfully. When the Work Sample is completed, the evaluator removes the drawing paper from the drawing board. The drafting tools are placed in their respective boxes for safe storage. It is not necessary to remove the drafting machine from the drawing board each time a student completes the Work Sample. The Work Sample is then placed in the proper box, and the lid is replaced.

Timing Procedures:

The Work Sample is timed from the moment the student signifies he understands the instructions, picks up the pencil and indicates that he is ready to begin drawing, until he puts down the pencil and indicates that he is finished.

Quality Checks:

Quality is checked by the evaluator through visual discrimination that the drawing paper is properly secured to the drawing board, that the student manipulates the drafting machine properly and that he is accurately measuring the details correctly from the work sheet and drawing correctly.

III. ADMINISTRATION

A. Student Orientation

Read or paraphrase the following information to the student:

The Work Sample that you are going to do is called the Drafting Work Sample.

The work you will be doing on this Work Sample is similar to the work that students do in the various high schools. It is also similar to the type of work that Assistant Drafters do in industry.

On this work sample, you will carefully look over and inspect the drafting arm. If you desire to move the drafting arm, you may do so with your left hand positioned on the drafting head (evaluator should now demonstrate how it should be done). Now, try it yourself.

Your job on this Work Sample will be to inspect and maneuver the drafting arm and draw as accurately as you can a 2 X 4 rectangular block centered in the middle of the drawing paper.

Please read all instructions carefully before starting to work.

A drafting arm is used for drawing horizontal, vertical and parallel lines. The combination of a drafting arm and two scales makes it possible to draw vertical and horizontal lines. The dimensions on the scales are used to obtain accurate measurements in dividing a line into a number of equal parts, in repeating space measurements, etc.

(cont)

(cont)

Place the drafting head on the drawing board.

Before you start drawing the required work, rule a one-inch border using the 2H pencil provided. Have a sharp point on your pencil. Keep you paper clean.

After you have practiced, you may begin drawing.

I will show you how to do the work in a minute but first, do you have any questions?

B. Instruction and Demonstrations

Sighted Population

You may have fifteen (15) minutes to practice, if you want, and become familiar with the drafting equipment after you have read the instruction:

A working drawing, such as the one that you will be drawing is a plan of a geometric shape. You must measure it accurately and then draw it on you drawing paper. See Figure III.

STATEMENT	ACTION
Tape your drawing paper to the drafting board	Show the student the worksheet illustrating how paper should be attached.
Your job is to draw a 1" border on all four sides of the drawing paper.	Show the student the worksheet with the 1" border on it.
Draw a title box in the lower right hand corner of the drawing paper as follows- Draw a box 1" high and 2" long. Then draw two light guide lines 1/4" apart in the middle of the box. Then print your name in between the 1/4" lines.	Show the student the worksheet with the title box drawn and filled in.

STATEMENT	ACTION
Look at the working drawing that you will be drawing on your drawing paper.	Show the student the worksheet.
Draw a view in the center of the drawing paper of a 2" X 4" rectangular.	Show the student the worksheet.
At any time you need help, ask your evaluator. You may also ask to have your drawing checked any time.	Observes whether there are any questions and then allows student to begin.
Go ahead and begin.	

Please return all of the drafting equipment to their proper boxes and containers with the covers put in place.

Please wipe all equipment clean to make sure pencil lead is is not left on them.

When removing the drawing paper from the drawing board, be sure that the masking tape is put in the waste basket.

If the student showed an interest and a potential for the work that he did in the Drafting Work Sample, a discussion of the drafting curriculum should follow.

Post Sample Interview Topics

1. Did you like or dislike drawing the block?
2. What do you think of drafting now that you have completed the work sample?
3. What did you like least (or most) about the drafting work sample?
4. Did you experience any difficulty in drawing this work sample?
5. Do you need more information about the Basic Mechanical Drawing Course?

If you take the Basic Mechanical Drawing Course offered next year and you pass the course, Assistant Draftsmen are hired in several firms located in this general vicinity. All are within a short drive from here and many are within walking distance from here. An Assistant Drafter can start anywhere from minimum wage to $4.25 per hour, depending upon how well you do in the Basic Mechanical Drawing Course. Drafting experience is also gained while employed as an Apprentice Drafter which could assist you in being promoted.

Other drawing courses are also available to you once you have successfully completed the Basic Mechanical Drawing Course. Some of these courses are Architechtural Drawing and Machine Drawing.

IV. SCORING

A. Explanations

1. Method of Scoring:

Productivity will be measured and assessed by comparing total time spent in completing all phases of the work sample. This total time will be compared with those times indicative of students with similar special needs. Quality will be assessed by the total number of errors made. An error will be assessed by the student's failure to complete any task successfully that he is asked to do, such as:

- Improperly position the drawing paper on the drawing board.
- Improper usage of drafting machine or tools
- Improperly measure work to be done.

2. Work Performance factors to be observed:

- Student able to follow verbal instructions accurately (or)
- Student able to read and interpret instructions.
- Student able to manipulate drafting equipment.
- Student able to perform tasks required properly.

B. Forms

Task Observation Record

School_____

DRAFTING WORK SAMPLE

Task Observation Record

Critical Errors (3 points each)

_____1. Border line 1" from edge and not drawn completely on all four sides of drawing paper.

_____2. View not positioned correctly.

_____3. Sloppily drawn (poor line weight)

_____4. Not able to measure correctly.

_____5. Not able to manipulate drafting arm.

Observation explanations for 1, 2, 3, 4, 5

Task Quality Errors (1 point each)

_____1. Did not tape drawing paper to drawing board correctly. (Aligned with scales)

_____2. Did not have sharp pencil.

_____3. Did not measure correctly. (Able but did not do)

_____4. Held pencil poorly or incorrectly

_____5. Incorrectly drew name box (location).

_____6. Incorrectly located rectangular view.

_____7. Poor corners (1-9) Total 9 points

_____8. Printing poor (not block)

Observational explanations for 1 through 8

Put additional comments and observations below.

_____ Critical errors

_____ Task quality errors

_____ Min _____ Sec Total time

_____ Date taken

_____ Evaluator

_____ Student

V. TECHNICAL DATA

A supplement to this manual is being developed at the time of this printing. It will include:

1. Norms
2. Reliability, test-retest studies
3. Validity
   a. Content validity - established through the Course Analysis based on methods suggested by U. S. Dept. of Labor Job Analysis techniques.
   b. Predictive Validity
      To be established through follow-up studies of students previously tested.

VI. MAINTENANCE AND CONSTRUCTION

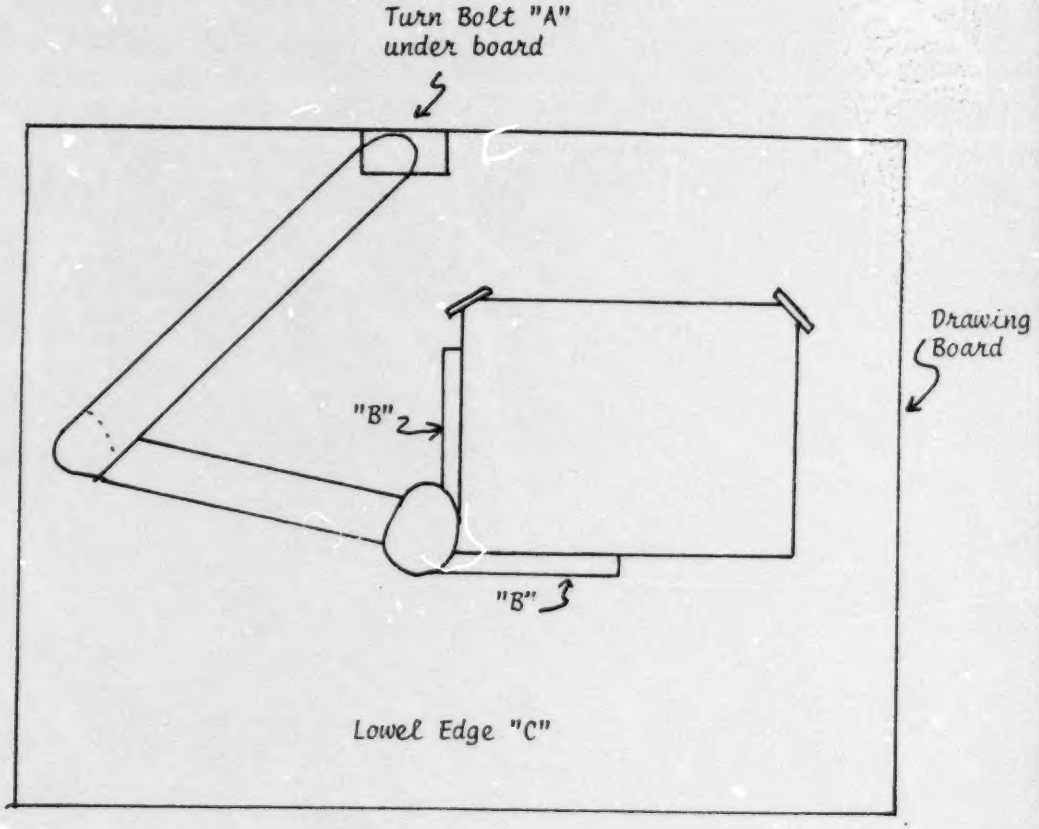
A. Maintenance

After each administration:

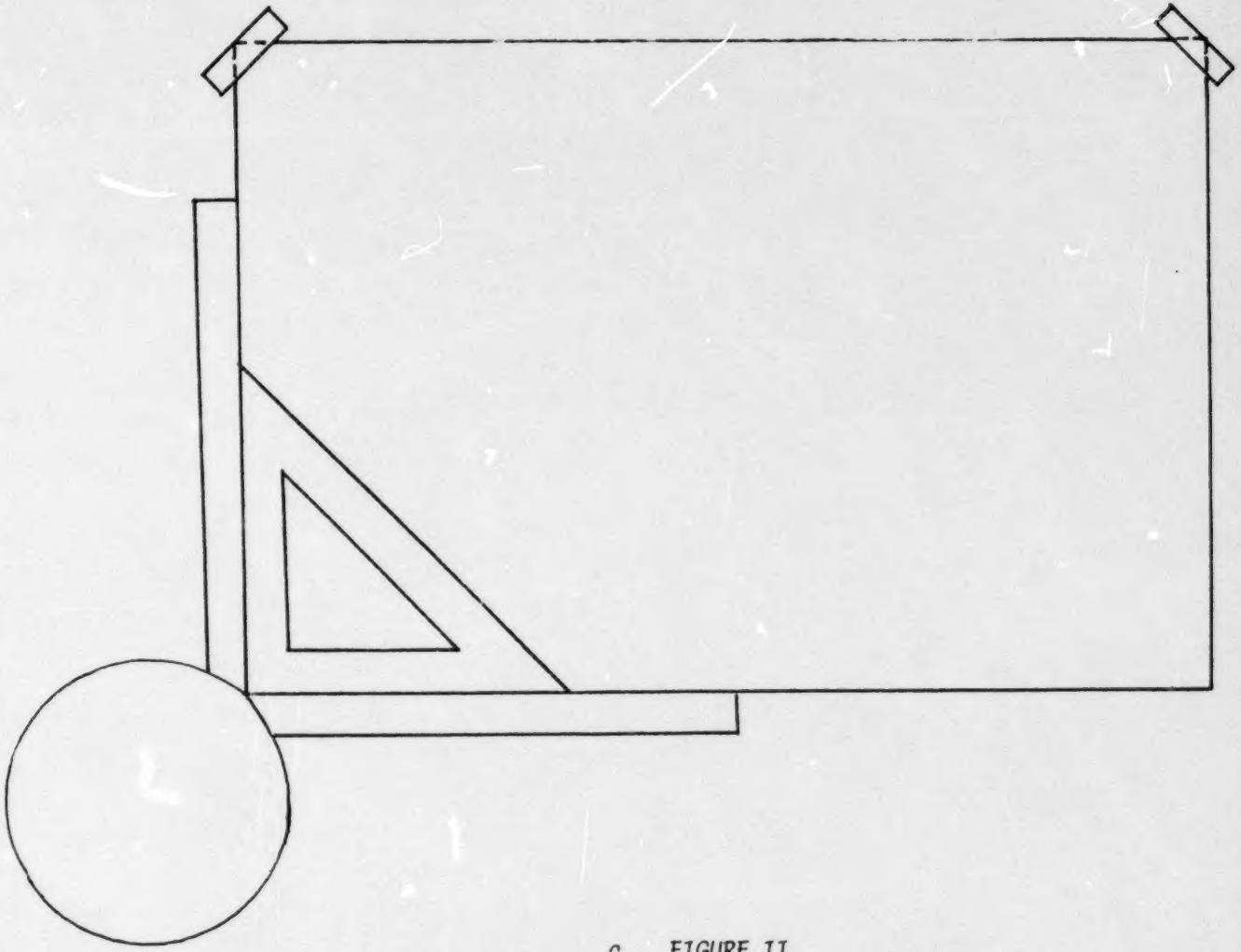
- Evaluator should see that all materials and equipment are returned to their proper places.
- Drafting equipment, etc., should be wiped clean of all graphite before storage.
- Drawing should be removed from drawing board and masking tape thrown away.

B. Materials List

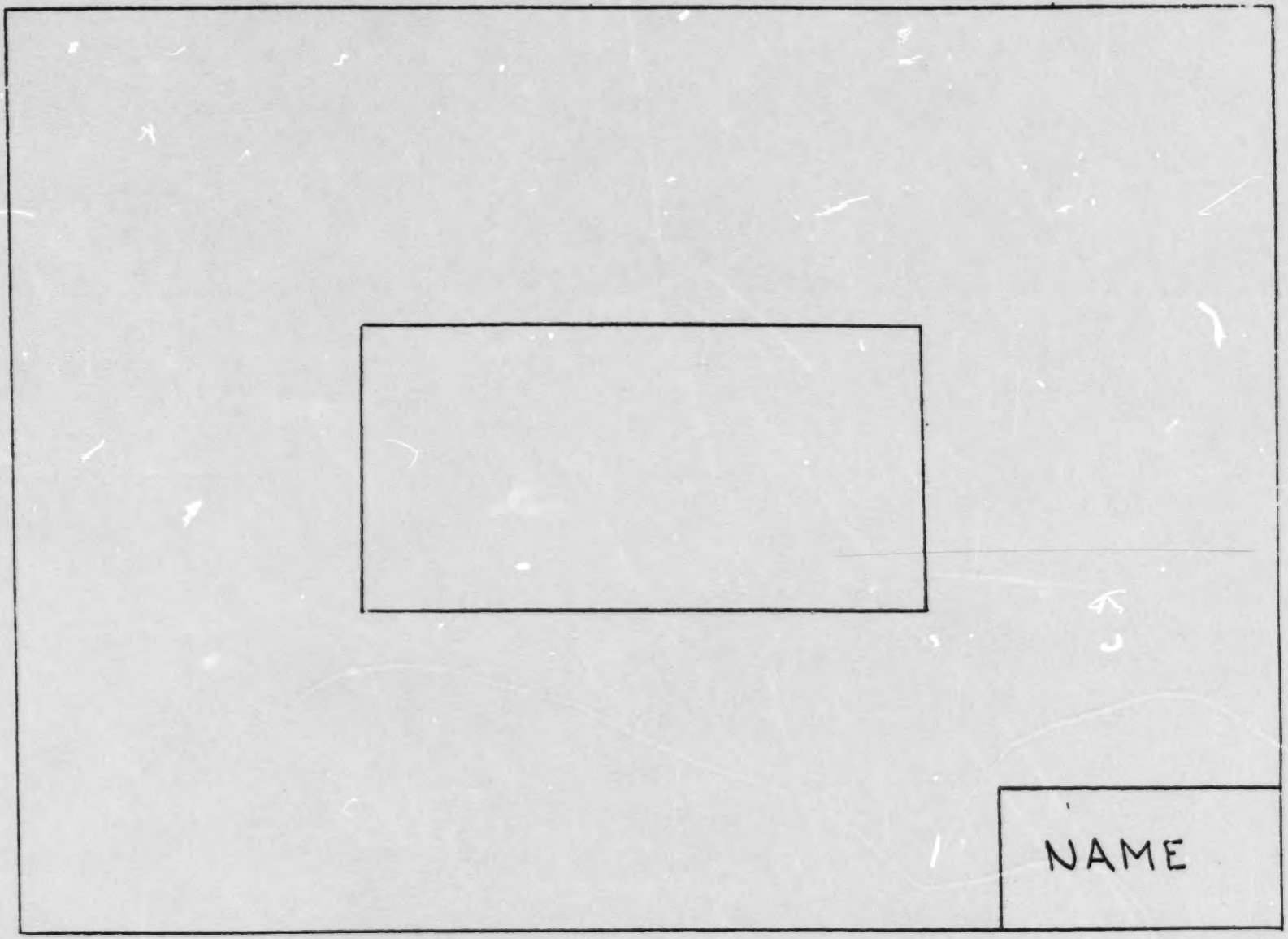
Equipment	Source	Price
1 Drafing Arm Vemco Model 3300 - 18	Charrette Corp. Woburn, MA	130.00
1 Drafting Board	Charrette Corp. Woburn, MA	20.00
2 - 12" Scales plastic	Charrette Corp. Woburn, MA	8.00
1 Roll Masking Tape, 1/2" wide	Charrette Corp. Woburn, MA	1.25
1 2H Pencil	Charrette Corp. Woburn, MA	.50
1 pkg. Drawing Paper	Charrette Corp. Woburn, MA	7.00
1 sq. ft. Cloth		.50
1 Eraser	Charrette Corp. Woburn, MA	.50
1 Drafting Brush	Charrette Corp. Woburn, MA	2.50
1 45°-90° Triangle	Charrette Corp. Woburn, MA	2.00
1 Table or Workbendh (30" high)	-	-
1 Stool or chair	-	-



C. FIGURE 1



C. FIGURE II



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C. FIGURE III

26

D. Assembly Instructions

Prior to the student starting his Drafting Work Sample, the Evaluator must set up the drawing board as shown in Figure 1:

1. Make sure turn bolt (A) is tight and drafting arm is secure.
2. Scales (B) are secure and perpendicular to each other.
3. The horizontal scale (B) is parallel to the lower edge of the board (C).
4. If scales are not perpendicular to each other, they must be aligned by utilizing the triangle as shown in figure 2.

VII. REFERENCES

Korn, T. (ed) A Work Sample Style Manual. Interface No. 10 Menomonie, WT.: Research and Training Center, University of Wisconsin - Stout, 1976.

United States Department of Labor, Dictionary of Occupational Titles, 3rd Edition. Washington, D.C.: United States Government Printing Office, 1965.

Handbook for Analyzing Jobs. Washington, D.C.: United States Government Printing Orrice, 1972.

Occupational outlook Handbook, 1970-71 Edition. Washington, D.C.: United States Government Printing Office, 1970.

APPENDIX

Definition of Terms

GED - Is the general level of learning and reasoning acquired through schools, experience and self study. There are six GED difficulty levels, ranging from (6) the most difficult to (1) the simplest.

SVP - Is the special vocational preparation and training in terms of the total time required to prepare for an occupation. It ranges from SVP 1, short demonstrations only, to SVP 9, over ten years.

APT - Refers to aptitudes, which is the quickness and ease with which you can learn to do something. Aptitude definitions are included on a separate page in this manual.

WA - Work Activities:

1. Dealing with things and objects.
2. Involving business contacts.
3. Of a routine, definite, organized nature.
4. Involving direct personal contact to help or instruct others.
5. Resulting in recognition or appreciation from others.
6. Involving the communication of ideas and information.
7. Of a scientific and technical nature.
8. Involving creative thing.
9. Involving processes, methods or machines.
10. Involving working on or producing things.

WS - Work situations are the conditions under which the work involved in any occupation takes place. There are ten types described and they have been related to the 66 Worker Trait Groups in the Guide for Occupational Exploration. They are:

1. Performing duties which change frequently.
2. Performing duties of a routine nature.
3. Planning and directing an entire activity.
4. Dealing with people.
5. Influencing peoples opinions, attitudes, and judgements.
6. Working under pressure.
7. Making decisions using personal judgement.
8. Making decisions using standards that can be measured or checked.
9. Interpreting and expressing feelings, ideas, or facts.
10. Working within precise limits or standards.

PD - *Physical Demands are the physical requirements of an occupation and are described in six areas as follows:*

1. *Lifting, carrying, pushing and/or pulling.*
2. *Climbing and/or balancing.*
3. *Stooping, kneeling, crouching, and/or crawling.*
4. *Reaching, handling, fingering, and/or feeling.*
5. *Talking and/or hearing.*
6. *Seeing.*

WC - *Working Conditions are the physical surroundings of a worker in a job. The DOL lists six different types as follows:*

1. *Inside or outside.*
2. *Extremes of cold plus temperature changes.*
3. *Extremes of heat plus temperature changes.*
4. *Wet and humid.*
5. *Noise and vibrations.*
6. *Hazards.*

Aptitudes are rated on a scale of 1 - Highest to 5 - Lowest as follows:

1 - Top 10% of the population
2 - Top third not including the top 10%
3 - Middle third of the population
4 - Lowest third not including lowest 10%
5 - Lowest 10%

The following are the definitions of the aptitudes:

G - General Learning Ability - The ability to "catch on" or understand instructions and underlying principles; the ability to reason and make judgements. Closely related to doing well in school.

V - Verbal Aptitude - The ability to understand meaning of words, and to use them effectively. The ability to comprehend language, to understand relationships between words and to understand meaning of whole sentences and paragraphs.

N - Numerical Aptitude - Ability to perform arithmetic operations quickly and accurately.

S - Spatial Aptitude - Ability to think visually of geometric forms and to comprehend the two-dimensional representation of three-dimensional objects. The ability to recognize the relationships resulting from the movement of objects in space.

P - Form Perception - Ability to perceive pertinent detail in objects or in pictorial or graphic materials. Ability to make visual comparisons and discriminations and see slight differences in shapes and shadings of figures and widths and lengths of lines.

Q - Clerical Perception - Ability to perceive pertinent detail in verbal or tabular material. Ability to observe differences in copy, to proofread words and numbers, and to avoid perceptual errors in arithmetic computation. A measure of speed of perception which is required in many industrial jobs even when the job does not have verbal or numerical content.

K - Motor Coordination - Ability to coordinate eyes and hands or fingers rapidly and accurately in making precise movements with speed. Ability to make a movement response accurately and swiftly.

F - Finger Dexterity - Ability to move the fingers, and manipulate small objects with the fingers, rapidly and accurately.

M - Manual Dexterity - Ability to move the hands easily and skillfully. Ability to work with the hands in placing and turning motions.

MR - Mechanical Reasoning - The ability to understand mechanical principles (pulleys, gears, etc)

E - Eye-Hand-Foot Coordination - Moving the hands and feet together in response to visual signals or observations.

C - Color Discrimination - Seeing likenesses or differences in colors or shades. Identifying or matching certain colors. Selecting colors which go well together.